

CLAIMS

We claim:

1. A method for cleaning one or more membranes normally immersed in a water rich in solids and used to permeate a water lean in solids comprising:
- 5 performing cleaning events at least once a week, each cleaning event having the steps of:
- (a) stopping permeation;
- (b) flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate normally passes through the membranes to provide chemical cleaner in an area in or adjacent the membranes for a selected duration; and,
- 10 (c) resuming permeation,
- 15 wherein the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of all cleaning events in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L.
2. The method of claim 1 wherein the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of all cleaning events in a week is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.
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3. The method of claim 1 wherein the water lean in solids is intended for drinking water and the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of all cleaning events in a week is
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between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

4. The method of claim 1 wherein the water rich in solids is a wastewater and the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and
5 the duration of all cleaning events in a week is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

5. A method for cleaning one or more membranes normally immersed in a water rich in solids in a tank and used to permeate a water lean in solids comprising:

performing cleaning events having the steps of:

(a) stopping permeation;

(b) flowing a selected concentration of a chemical cleaner through the membranes in a direction opposite to the direction in which permeate passes through the membranes in repeated pulses followed by waiting periods, the repeated pulses and waiting periods in a cleaning event cumulatively having a selected duration; and,

(c) resuming permeation;

wherein the membranes are not agitated while the
20 chemical cleaner is flowed through the membranes.

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7. The method of claim 6 repeated between 1 and 7 times per week.

7. The method of claim 6 wherein the product of the concentration of the chemical cleaner expressed as an equivalent
25 concentration of NaOCl in cleaning efficacy and the duration of the pulses and waiting periods in a week is between 2,000 minutes•mg/L and 30,000 minutes•mg/L.

8. The method of claim 7 wherein the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of the pulses and waiting periods in a week is between 2,000 minutes•mg/L and 20,000 minutes•mg/L.

9. The method of claim 6 wherein the water lean in solids is intended for drinking water and the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of the pulses and waiting periods in a week is between 5,000 minutes•mg/L and 10,000 minutes•mg/L.

10. The method of claim 6 wherein the water rich in solids is a wastewater and the product of the concentration of the chemical cleaner expressed as an equivalent concentration of NaOCl in cleaning efficacy and the duration of the pulses and waiting periods in a week is between 10,000 minutes•mg/L and 30,000 minutes•mg/L.

11. The method of claim ⁶~~5~~ wherein the pulses last for between 10 seconds and 100 seconds and the waiting periods last for between 50 seconds and 6 minutes.

12. The method of claim ⁶~~5~~ wherein the pulses last for between 10 seconds and 100 seconds and the waiting periods last for between 50 seconds and 3 minutes.

13. The method of claim ⁶~~5~~ wherein the length of the pulses is selected to provide chemical cleaner in an area in and adjacent to the membranes with an initial efficacy and the length of the waiting periods is selected to provide substantially effective chemical cleaner in an area in and adjacent to the membranes during the waiting period.

15 ~~14~~ The method of claim ~~6~~ wherein the membranes are hollow fibre membranes and the pressure of the pulses is between 5 kPa and 55 kPa above the pressure on the outside of the membranes.

16 ~~15~~ The method of claim ~~14~~ wherein the flow through the
5 membranes during the pulses is between 8.5 and 51 L/m²/h/bar.

17 ~~16~~ The method of claim ~~8~~ wherein chemical cleaner is removed from the tank as retentate before permeation is resumed.

18 ~~17~~ The method of claim ~~16~~ wherein substantially all of the
10 chemical cleaner removed from the tank as retentate before permeation is resumed.

18. A method for cleaning one or more membranes immersed in water rich in solids and used to permeate a water lean in solids wherein each cleaning event comprises the steps of:

- 15 (a) stopping permeation and agitation of the water containing solids;
- (b) flowing a chemical cleaner through the membranes in a direction opposite to the direction in which permeate passes through the membrane;
- 20 (c) resuming permeation; and,
- (d) resuming agitation,

and wherein permeate collected before resuming agitation is wasted or recycled to the water containing solids and wherein the membranes and the membranes remain immersed during steps (a), (b), (c) and (d).

25 19. A method for cleaning one or more membranes used to

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filter water containing solids to produce a permeate comprising cleaning events wherein:

- (a) permeation is stopped;
- (b) water heated to at least 25C or steam is flowed through the membranes in a direction opposite to the direction in which permeate normally passes through the membrane; and,
- (c) permeation is resumed.

20. The method of claim 19 wherein (i) the cleaning events are performed between twice a day and once every two days and (ii) the duration of the cleaning events is between 30 minutes and 90 minutes.

21. The method of claim 19 wherein the water heated to at least 25C or steam is heated to between 40 celsius and 120 celsius.

22. The method of claim 19 wherein in a cleaning event the water heated to at least 25C or steam flows in repeated pulses followed by waiting periods.

23. The method of claim 22 wherein the membranes are immersed in water which is not agitated during the cleaning events.

24. The method of claim 23 wherein the pulses last for between 10 seconds and 100 seconds and the waiting periods last between 50 seconds and 3 minutes.

25. The method of claim 24 wherein the duration of each cleaning event is between 30 minutes and 90 minutes.

26. The method of claim 25 wherein the cleaning events are repeated between twice per day and once every two days.

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